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SCHOOL AND HOME GARDENING

By R. S. Mackintosh, Division of Agricultural Extension

The world needs food. Fruits and vegetables are food products that can be grown by every person who has land adapted to the growth of plants. Fruits and vegetables do not contain so many food units as wheat or meat because of the large amount of water in them. However, they do provide a large amount of valuable food and in addition furnish variety. They also contain certain materials lacking in other food products. For these reasons they are indispensable. It is therefore the patriotic duty of every person who is able to get a piece of land to have a garden in 1918.

The slogan, **Food Will Win the War**, will mean more to every child when he realizes the importance of knowing plants and the trials the farmer has in producing food. The child must be taught that gardening this year is really **Helping Uncle Sam** to win the war and that he is an important help to his big and fine Uncle Sam. Practically all children are interested in living things. Animals can move about and often become special pets. Plants must stay in one place. When their attention is directed to the habits of plants children become interested and a new world is opened to them. The production of food appeals to them and when some of the hard work is taken away most children become plant lovers and are interested in everything that takes place in the garden.

This outline is prepared to assist teachers and club leaders in systematizing the teaching of gardening in the high school and upper grades so that a lot of food will be produced in 1918. At the same time it may aid children in becoming acquainted with plants, how they work, and their uses; something about soils, insects, plant diseases, harvesting, and marketing; and other things that come up incidentally. It is written in simple language with few technical terms. If used in high schools, additional material must be added to make the study more complete. Gardening is taught in colleges, high schools, and grade schools. The subject matter, method of presentation, and individual work by the student must be considered very carefully. Only some of the more positive factors that relate to successful garden work are considered. The teacher must have available either a fund of knowledge from his own experience or a collection of good books and bulletins that give detailed information in a more extended form. The entire subject can not well be taken from text-books and bulletins, therefore the more knowledge the teacher has of gardening the better. The teacher must be able to inspire the children to overcome difficulties and to do the necessary things in the garden at the right time and in the right way. It is necessary to know plants, their habits, their susceptibility to adverse conditions, as frost, drouth, heat, and winds, and to know insects and diseases.

A garden properly supervised is the best kind of a laboratory in which to study plants and plant products. The methods used to make plants grow in the garden are fundamentally the same as for the larger crops, as corn, wheat, and cotton. Just as a child with scissors and needle can make a garment, or with saw and nails can make a box, so with a plot of ground, a few seeds, a hoe, and the help of the sun, he can produce a radish, a strawberry, or a tomato. All the steps taken by the little plant to get out of its quiet little home in the seed, establish itself in the soil, and grow upward into the air and light, and in due time produce food that the world needs are interesting and instructive points that should be familiar to every child. We often think of the large factories that turn out binders to harvest the fields of grain, the locomotives that pull the trains from the Atlantic to the Pacific, and the automobiles that are so common for all sorts of purposes, but we do not often consider the numberless plants as important factories in which all the food is put together out of the raw materials from the soil and air.

Gardening is the cultivation of plants by man for the production of food, clothing, and shelter, and for decoration and other economic purposes. The subject must be correlated with botany, physiology, physical geography, entomology, chemistry, and physics. In fact, when the garden is measured with a yardstick, land surveying is used. The cost of growing and the income, when figured in dollars and cents, is bookkeeping or accounting. The botany teacher has a rare opportunity to make the study a real live one by using the garden plants when studying plant anatomy, names and relationship and distribution of plants, and the names and uses and functions of the various parts.

Interest in gardening can be stimulated this year among adults by means of public meetings, publicity appeals through the newspapers, and personal letters, and through the school children. If the men are too busy with other lines of productive work, the women and children can do a large amount of the work.

Garden work must be very carefully supervised the same as work in the class room, manual training shop, or domestic science kitchen before school credits can be allowed. The regulations should include:

1. A competent supervisor must be in charge during the growing season.
2. The time spent and the quality of the work done must be considered.
3. A full set of records of expenses and income should be kept, including a plan of the garden, the story of the garden, the kinds of crops grown, how used or marketed, and the weeds, insects, and diseases that were troublesome.

In all cases the drudgery that is charged to the garden should be reduced to the minimum by planning the garden carefully and by doing everything at the right time and in the right way. This statement applies particularly to keeping the garden free from weeds.

THE PLANT

The plant has many parts and these parts, or organs, do certain things, or are for certain purposes. A person can not describe an object very well unless he knows the names of the parts of which it is composed. For instance, an automobile has wheels, a hood, a radiator, a steering wheel, clutches, and many other parts. The wheel has a hub, spokes, flanges, rubber tire, etc. The plant has roots, root hairs, stem or trunk, branches, leaves, and most of our vegetables have flowers and produce seeds. Each leaf has certain parts and each has something to do. In the leaves of the green plants there are millions of small green bodies which catch certain rays of light from the sun and this

energy, or power, is used to put together the different plant food materials into substances the plant uses to build or repair itself. This putting together is one of the most important things in the world, for on this process we depend entirely for the food we eat. All the wild and domestic animals feed more or less on plant tissues and in turn we use their flesh for food.

The work of the plant may be likened to the housewife when cooking. She takes some flour, salt, sugar, fat, and water, mixes them together, and puts the mixture into a hot oven to cook. The loaf of bread that comes out is one of our most important foods, often called the "staff of life." Plants are the most important factories in the world. If we neglect the study of plants, we overlook one of the most vital topics in all the world.

GARDEN SOILS

The soil is our greatest natural asset. It is made up of particles of minerals, rocks, and decayed plant and animal matter. Plants can not thrive unless the soil has the proper tilth and is supplied with sufficient plant food materials —water and air—in available form. Tilth, or physical condition, refers to the arrangement of the materials that compose the soil. If soil is hard and compact it must be made lighter and loose by plowing, spading, or cultivating, and by the addition of vegetable matter, as manure. If loose it may be firmed by rolling or even by walking over the surface. The soil should always be worked, plowed or cultivated, when its tilth will be improved, therefore do not work the soil when too wet because of the danger of forming clods and lumps. In all soils there are living organisms—bacteria and fungi—that help in making the soil more suited or unsuited to other plants. Gardeners are especially interested in the work of the organisms that improve the soil.

Soils are divided into groups according to the size of the particles, as clay, loam, and sand. Clay is made up of the finest materials and is often called a cold or heavy soil because of the large amount of water that is held in and between the particles. Sand is made up of coarse particles and is often called a warm or light soil. Loam is composed of medium-sized particles. The ideal garden soil is a sandy loam, that is, composed of loam and sand. It should be at least six inches deep and underlaid with a heavier subsoil. Such a soil is easily worked, warms up quickly in the spring, and will hold enough moisture to supply the crop except during a drouth.

The soil may be likened to a store. In a well-equipped grocery, for instance, there are food materials of all kinds ready for the housewife to use in preparing meals. Some of the materials, as sugar, are ready to use, while others, as flour, must be cooked. All the different materials are needed to supply the demands of the people of the community. The soil must contain a sufficient supply of all the materials needed by the plants, because the plant can not send away for supplies. Some of the principal minerals needed are nitrogen, phosphorus, potassium, calcium, iron, and sulphur. Water is one of the principal materials needed by plants to dissolve and carry the minerals and other substances as the plant needs them. Unless there is plenty of water the plants suffer, therefore the water supply must be carefully regulated and controlled. Tillage helps greatly to prevent the escape of water from the surface, as a dust mulch is maintained. When manure is added, or any vegetable material, as clover, rye, grain stubble, or cornstalks is plowed under, it decays and adds plant food to the soil. Material of this kind is called organic matter or humus, and it aids in increasing the water-holding capacity of the soil as well as making the soil looser or more friable.

Drainage is often necessary to help in getting the surplus water off or out of the soil within a reasonable time. Soldiers are very careful to see that the

drainage around their tents is sufficient to take away the water during rain storms. Gardens may be drained by plowing into beds, thus making open ditches, or by tile draining. The latter is the better method but is the most expensive.

Before plants can start in the spring the soil has to "warm up"; and the lighter soils, or the ones which hold the least water, are best suited to early crops. Air is necessary to provide oxygen for the development of the bacteria and fungi in the soil. Most of these low forms of plant life are beneficial because they help break down and put together the food materials needed by the crops. The soil is very complex and it is necessary to take good care of it, if it is to furnish the materials needed by the crops in future years.

LOCATION OF GARDEN

The garden should be convenient to the house so that every spare moment not needed elsewhere can be spent in it. It should not be shaded by buildings or trees. Plants must have a certain amount of direct sunlight, altho some require more than others. Lettuce and spinach need less direct sunlight than beans or peas. A southern or southeastern exposure is desirable for most crops, especially for the early vegetables.

GARDEN PLANS

A good garden plan saves time in planting and gives each crop the best location and the space needed by it. Make an outline on paper to scale, of the garden and the location and amount of each crop to be grown. Arrange crops according to size, character of growth, and succession. Consider whether some can be grown together as companion crops. Some of the vegetables that require a large amount of space are: Pole and Lima beans, late sweet corn, tomatoes, eggplants, peppers, husk tomatoes; root crops, as late beets and carrots, parsnips, salsify, and rutabagas; vine crops, as cucumbers, melons, squashes, and pumpkins; late potatoes; and onions. Crops that may be planted early and followed by successive plantings of the same kind or other kinds in this or the following group are: Radishes, spinach, lettuce, early beets, carrots, and turnips, early sweet corn, early cabbages, dwarf beans, peas, and onion sets. Crops that can be planted after others: Spinach, late cabbages, cauliflowers, late beets, carrots, and turnips, late celery, Brussels sprouts, kale, tomatoes, and endive. Crops that may be planted together, that is, companion crops: Lettuce and early cabbage; beets, early celery or early beans; early sweet corn and beans; spinach and parsnips; and many other combinations. Such combinations save room but require more work, more plant food and more moisture in the soil.

FORCING

Forcing means the starting of seeds under cover in order to get earlier crops and to grow certain crops, as tomatoes, that naturally require a longer season. The hotbed and cold frame are useful in small gardens. Plants grown inside must be "hardened off" before setting in the open garden. This is done by allowing them to remain in the open air for a while each day until hardened. In the open garden, boxes of heavy paper or wood covered with glass or cloth aid in protecting plants during cool weather. Turning a furrow toward the north and setting plants or sowing seeds on the south side helps to protect plants. Sowing seeds at five-day intervals in the same hill or row often saves time in trying to escape frost injury For instance, some gardeners plant early sweet corn, melons, or similar crops a week or two earlier than usual and plant

more seeds near the first about five days later in order to have seeds in the ground ready to come up if the earlier plants are killed. Use shallow boxes (called flats), flower pots, tin cans, paper or wood-veneer earth bands, or pieces of sod, for starting early plants and to aid in handling them. Always transplant seedlings before they are tall and spindling.

SEEDS

Get seeds early of standard varieties, from reliable dealers, and store them in a safe, dry place. Test seeds unless the dealer guarantees germination. Follow lists recommended for the locality by reliable authorities. Write names of seeds on wood labels to save time when planting. The supply of some kinds of seeds is low this year, therefore do not sow too thick. Save seeds from some of the best plants this year for use in 1919.

GARDEN TOOLS

In large gardens the farm plow, disk, harrow, and light cultivator are used, but in small gardens the spade or spading fork, steel rake, hand cultivator, hoe, and weeder are used to prepare and till the soil. In sowing seeds and transplanting seedlings, a line with two sharp-pointed stakes is needed to mark the row. A yardstick is useful in spacing rows. Good tools are better than cheap ones. Rusty tools make the garden work much harder. Have a place for every tool, in a dry room. Clean all tools before putting them away.

SOWING SEEDS

Sow seeds in freshly stirred soil after a rain rather than before, in furrows deep enough and far enough apart to permit plants to develop without too much crowding. Cover seeds with earth and firm the surface so as to get the soil close to the seeds. Study each type of plant to note method of germination. Study the table carefully to know when to sow each kind. The seeds of hardy plants can be sown as soon as the soil can be prepared, while others can not be planted until the soil is warm and danger of frost is past. These can be sown early, or as soon as the soil is ready: Beets, carrots, cabbages, lettuce, onions, parsley, early peas, radishes, spinach, and turnips. About two weeks before the last frost is expected, dwarf beans, early sweet corn, summer squash, melons, and others may be planted.

TRANSPLANTING

Transplanting is the moving of plants from one place to another. Small seedlings are moved from the seedbed to flats or pots so that they can have room to develop before moving to the field. The first move or shift is often to places where they will be from two to three inches apart. Success depends largely on the skill of the operator. The soil about the plants should be watered before the plants are moved, and after they are set sufficient water is put on to wet it thoroly. Protect the plants from sun and winds for a few days after moving. The tops of some leafy plants should be trimmed to prevent too rapid wilting. Success in transplanting depends upon having the plants full of water before lifting, and protected during the time they are out of the soil, firming the soil about the roots, and leaving some loose soil on the surface to prevent the soil from drying out. Tomato, cabbage, celery, and similar plants grow stockier when transplanted one or more times.

TILLAGE

In many ways tillage is the most important work in the garden. It is the stirring of the soil, as plowing, spading, harrowing, raking, or cultivating.

Tillage aids in controlling the soil moisture, temperature, and structure, or tilth, aids the soil organisms, and destroys weeds. The killing of weeds should be the last consideration, because when the surface is thoroly tilled weeds can not grow. Surface cultivation consists in stirring the upper two inches with any form of cultivator, rake, or hoe after every rain and oftener during dry weather.

THINNING

Thinning is the removal of certain plants to give room for those remaining to develop properly. The aim is not to produce overgrown specimens but merely to provide space for each to grow to a reasonable size. Thinning is necessary when too many seeds are planted. Very often the "thinnings"—the plants pulled out—can be used in the kitchen. Remove the weaker plants before it is too late and in such a way as not to injure the roots of those that are left. Avoid thinning as much as possible by sowing the right amount of seed.

WATER SUPPLY

The amount of water held by the soil that is available for the plants often determines the success or failure of the garden. Plants must have sufficient moisture at all times, especially when the crop is maturing. When the supply in the soil runs too low, artificial watering must be resorted to. Water should be applied during the late afternoon or evening, enough to wet the soil to a depth of from three to five inches rather than a little very often. When the surface soil is again dry, cultivate to form a new dust mulch, in order to prevent loss of water by evaporation.

PLANT ENEMIES

Weeds have been mentioned as being very injurious in the garden because they occupy the room and absorb the food needed by the crop. Certain insects and diseases are injurious and even destroy the garden crops. We must not, however, consider all insects injurious, because some are beneficial, especially those, as lady bugs, that feed on injurious insects.

Injurious insects are divided into two groups according to their method of obtaining food: (a) Biting insects—potato bugs, cabbage and currant worms—obtain their food by chewing or eating the plant tissue. Sprays containing some forms of arsenic are usually used to kill insects belonging to this group. (b) Sucking insects obtain their food by sucking the plant juices, as the mosquito sucks blood. The various kinds of plant lice are representatives of this class and are killed by means of contact with poisons as tobacco extracts, gases, and tobacco smoke.

Many diseases of plants are caused by bacteria and fungi, commonly called blight, rot, smut, mildew, scab, and rust. Each disease has certain specific characters which make it possible to identify it, the same as the higher forms of plant life have. The life history of each must be known before control methods can be worked out satisfactorily. Control methods may be grouped under one or more of these heads: Sanitation, seed disinfection, rotation of crops, spraying, and dusting. (See references on page 8.)

There are plant troubles which are not caused by any of the foregoing insects or diseases but which are due to poor soil conditions, or too much water.

HARVESTING

"The proof of the pudding is in the eating." In like manner the results of the efforts put forth in cultivating the garden are determined at harvest time.

Harvest begins with rhubarb and asparagus in the early spring, and continues through the summer, fall, and winter, or the full twelve months. Vegetables need to be gathered at the proper stage of development and used immediately in order to obtain the highest quality. Some vegetables remain at the proper stage for only a few days, while others are in proper condition for several weeks or months. Each variety differs in some particular. One of the reasons for having a good home garden is to get the vegetables as needed direct from the plant or soil when their flavor is best.

MARKETING

Marketing is the selling of the surplus not used in any other way. Persons engaged in growing vegetables for sale are called market gardeners or truckers. It is first necessary to study the local market or stores to see what methods are used, because it is better to follow established methods than to adopt new ones. The product offered for sale should be well prepared by washing or brushing, assorted as to size and color, and put up in an attractive manner.

As a rule, overgrown specimens are not desirable, for quality is more important than size. More fruits and vegetables are sold by the pound than by measure or count. Such vegetables as asparagus, rhubarb, radishes, green onions, small beets, carrots, parsnips, and salsify are tied in bunches and sold by count with the bunch as the unit. The mature root crops, beets, carrots, onions, parsnips, rutabagas, and turnips, are sold by the weighed bushel.

EXHIBITS

The subject of exhibits may not seem to be a real garden topic, but it is an important part in the "game of gardening" and it has its important educational features. An exhibit at the school, county, or state fair brings together products and gives those interested a chance to study and compare results. All exhibits should be neat and attractive. Root crops may be brushed or washed. It is important that the specimens selected be uniform in shape, size, and color, and the right number shown. Follow all rules carefully.

PRESERVATION

Vegetables not used at once should be preserved in some way for future use. There are three ways of preserving vegetables: a. Canning in glass jars or tin cans by the cold-pack method. b. Drying in the sun or by artificial heat. c. Storing in a cool, dry cellar or pit during the winter. These methods are fully described in the Farmers' bulletins published by the United States Department of Agriculture. (See page 8.)

KINDS AND VARIETIES OF VEGETABLES

Many kinds and varieties of vegetables are listed by seed dealers and it is often difficult to select the best. For the home garden the common standard varieties of easiest culture and with the highest quality should be selected. A selected list for use in Minnesota is given in Special bulletin No. 11, and Farmers' Institute Annual No. 30.

Each kind of vegetable should be studied separately and a story written according to the sample given below. The pupils should consult the bulletins and books for the information needed.

Kind—(Sweet corn.)

Variety—(Golden Bantam. This is a yellow variety that is used extensively because of its extra good quality for table use.)

Soil—(Sandy loam or any good soil suitable for field corn.)

How propagated—(From seed.)

Time of planting—(In the latitude of St. Paul from May 15 to last of June, at two-week intervals, to provide a continuous supply.)

How planted—(In rows 30 inches apart and the stalks in hill or drills from 15 to 30 inches apart. Plant about four kernels per hill or one seed per foot in drills.)

Amount of sunlight required—(Full light. Does not thrive in shade.)

Special requirements—

Staking—(None.)

Blanching—(None.)

Spraying—(None.)

Insects affecting—(Cutworms, plant lice, corn ear worms, white grubs.)

Diseases affecting—(Smut.)

When harvested—(For table use, as soon as kernels are full size but not hard, so-called milk stage; for seed, when kernels are hard and wrinkled.)

How preserved—(Canned, salted, or dried.)

When to save seed for next crop—(Select the earliest and best ears as they mature. Store in a dry place. Do not allow ears to touch while drying.

REFERENCES

There are excellent books that give all the information available on gardening and related subjects. These should be used as the basis for these outlines. Besides these, many state and government bulletins are available. These can be obtained by writing to the addresses given. Many of the seed houses publish catalogs and booklets of value. Due allowance must be made for local conditions in the books, bulletins, and catalogs unless prepared for Minnesota.

Books

Green, S. B. Vegetable gardening. Webb Pub. Co., St. Paul. 1914. $1.
Watts, R. L. Vegetable gardening. Orange Judd Co., N. Y. 1912. $1.75.
Lloyd, J. W. Productive vegetable growing. Lippincott, Philadelphia. 1914. $1.50.
Corbett, L. C. Garden farming. Ginn, Boston. 1913. $2.
The above are excellent manuals for teachers and advanced pupils.
French, Allen. Beginner's garden book. Macmillan. 1914. $1.
Hall, Bolton. Garden yard. McKay, Philadelphia. 1909. $1.
Rexford, E. E. A-B-C of vegetable gardening. Harper. 1916. 50 cents.
Rexford, E. E. *Home garden. Lippincott, Philadelphia. 1909. $1.25.*
Rockwell, F. F. Gardener's pocket manual. McBride, Nast & Co., N. Y. 1914. 75 cents.
Rockwell, F. F. Home vegetable gardening. Winston Co., Philadelphia. 1911. $1.
Watts, R. L. Vegetable garden. Outing Pub. Co., N. Y. 1915. 70 cents.
These are all useful books and worthy of being in any school or home library.
Hood, G. W. Practical school and home gardens. Long & Co., Lincoln, Neb. 1916. $1.25.
Nolan, A. W., and Greene, J. H. Vegetable gardening and canning. Row, Peterson & Co., Chicago. 1917. 32 cents.
Full of practical information for school garden workers.

Bulletins

Minnesota Bulletins

Address Office of Publications, University Farm

153. Fruit and Vegetable Diseases and Their Control.
17. Farm Vegetable Garden.
11. A Garden for Every Home.
Farmers' Institute Annual No. 30. Postage 6 cents.

Farmers' Bulletins

Address U. S. Department of Agriculture, Washington, D. C.

218. The School Garden.
255. The Home Vegetable Garden.
460. Frames as a Factor in Truck Growing.
818. The Small Vegetable Garden.
839. Home Canning by the One-Period Cold-Pack Method.
841. Drying Fruits and Vegetables in the Home.
856. Control of Diseases and Insect Enemies of the Home Vegetable Garden.
879. Home Storage of Vegetables.
884. Saving Vegetable Seeds for the Home and Market Garden.
916. A Successful Community Drying Plant.
936. The City and Suburban Garden.
937. The Farm Garden in the North.